TBC1D20 gene

TBC1 domain family member 20

Normal Function

The *TBC1D20* gene provides instructions for making a protein that helps regulate the activity of other proteins called GTPases, which control a variety of functions in cells. Often referred to as molecular switches, GTPases can be turned on and off. They are turned on (active) when they are attached (bound) to a molecule called GTP and are turned off (inactive) when they are bound to another molecule called GDP. The TBC1D20 protein turns off a GTPase known as RAB18 by stimulating a reaction that turns the attached GTP into GDP. When active, RAB18 is involved in a process called vesicle trafficking, which moves proteins and other molecules within cells in sac-like structures called vesicles. RAB18 regulates the movement of substances between compartments in cells and the storage and release of fats (lipids) by structures called lipid droplets. The protein also appears to play a role in a process called autophagy, which helps clear unneeded materials from cells. RAB18 is important for the organization of a cell structure called the endoplasmic reticulum, which is involved in protein processing and transport.

The TBC1D20 protein is also thought to inactivate another GTPase called RAB1. RAB1 is important for maintaining the structure of a cell compartment called the Golgi apparatus, in which newly produced proteins are modified so they can carry out their functions. The TBC1D20 protein also appears to play a role in the copying (replication) of viruses in infected cells.

Health Conditions Related to Genetic Changes

RAB18 deficiency

At least five mutations in the *TBC1D20* gene have been found to cause Warburg micro syndrome, which is the most severe of the disorders caused by RAB18 deficiency. Warburg micro syndrome is characterized by multiple eye abnormalities, vision impairment, severe intellectual disability, and a reduction of the hormones that direct sexual development (hypogonadotropic hypogonadism).

The *TBC1D20* gene mutations that cause Warburg micro syndrome eliminate the function of the TBC1D20 protein. Researchers suspect that loss of this protein's function disrupts the normal control of RAB18 activity. It is unclear, though, how the resulting changes in RAB18 activity might lead to eye problems, brain abnormalities, and other features of Warburg micro syndrome.

Because Warburg micro syndrome can be caused by mutations in other genes that disrupt normal RAB18 activity, loss of control of this GTPase is thought to underlie

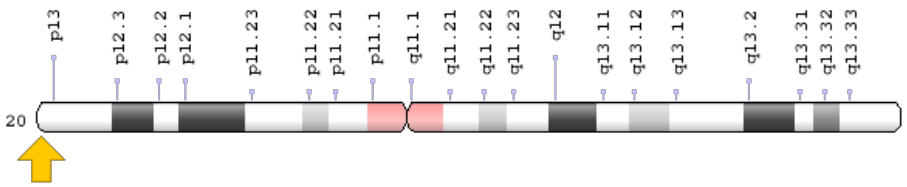
the condition. It is unclear if impaired regulation of RAB1 activity contributes to the features of the condition.

Coloboma

Chromosomal Location

Cytogenetic Location: 20p13, which is the short (p) arm of chromosome 20 at position 13

Molecular Location: base pairs 435,480 to 462,543 on chromosome 20 (Homo sapiens Updated Annotation Release 109.20200522, GRCh38.p13) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- C20orf140
- dJ852M4.2
- WARBM4

Additional Information & Resources

Educational Resources

- Basic Neurochemistry: Molecular, Cellular and Medical Aspects (6th edition, 1999): Small G proteins
  https://www.ncbi.nlm.nih.gov/books/NBK28084/

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28TBC1D20%5BTIAB%5D%29+OR+%28TBC1+domain+family+member+20%5BTIAB%5D%29%29+OR+%28%28TBC1+domain+family+member+20%5BTIAB%5D%29+OR+%28WARBM4%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- TBC1 DOMAIN FAMILY, MEMBER 20
  http://omim.org/entry/611663

Research Resources

- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=TBC1D20%5Bgene%5D
- HGNC Gene Symbol Report
  https://www.genenames.org/data/gene-symbol-report/#!/hgnc_id/HGNC:16133
- Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:128637
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/128637
- UniProt
  https://www.uniprot.org/uniprot/Q96BZ9

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